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OZONE NONATTAINMENT ANALYSIS
CLEAN AIR AMENDMENTS OF 1990

EPA Contract No. 68-DO-0120

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EXECUTIVE SUMMARY

This report provides results of the analysis of the ozone nonattainment and mobile source related provisions of the Clean Air Act Amendments (CAAA). The analysis was conducted using the Emission Reduction and Cost Analysis Model (ERCAM) developed for the U.S. Environmental Protection Agency (EPA) by E.H. Pechan & Associates, Inc., with substantial inputs on air quality targets, emissions inventory, and stationary and mobile source control costs and effectiveness provided by EPA staff in the Office of Mobile Sources and the Office of Air Quality Planning and Standards.

The model estimates the effectiveness of the current control program for future years as a base for applying measures and requirements associated with the CAAA. Major uncertainties exist in a number of important areas, including the following:

1. the volatile organic compound (VOC) emissions inventory;

2. likely underestimation of total controls (and, therefore, costs) due to the VOC emission reduction targets having been derived from a simplified assessment;

3. vehicle travel and stationary source growth projections;

4. cost/effectiveness and feasibility for new measures such as consumer solvents, marine vessels, new CTGs, and unidentified controls used to meet progress requirements at an assumed cost of $2,000 to $10,000 per ton;

5. the relative cost of alternative fuels and gasoline;

6. the effect of projected NO_x controls for vehicles and utilities (not included in estimating VOC reduction targets) and;

7. the effects of regional transport among cities and natural VOC emissions (not included).

The key provisions of the CAAA that were included in the modeling analysis are detailed in the report. Certain features, such as new source offsets, off-road vehicle standards, and regional transport, were not included due to analytical and time constraints. For analytical purposes, it was assumed that required measures are feasible, that they will be implemented in a timely fashion, and in a manner consistent with EPA's interpretation of the CAAA. Note that this analysis was performed while many CAAA associated regulations are being prepared, so, at best, the assessment is a snapshot of knowledge as of September 1991.

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II RESULTS

A summary of the VOC related costs and emission reductions by measure for a 1995 projection year is shown in Table II.1. Results for projection years 2000, 2005, and 2010 are provided in Tables II.2, 3, and 4, respectively. NO_x results are presented later in this Chapter. Measures analyzed in the tables are divided into five categories.

1. The base program and Reid Vapor Pressure (RVP) I represent regulations and standards that are already in force and therefore will affect emissions regardless of the new measures prompted by the CAAA. The major controls of the base program are full implementation of existing State Implementation Plans (SIPs), the existing Federal Motor Vehicle Control Program (FMVCP), and new source controls. The cost of the base program and RVP are not included in the totals ascribed to the CAAA.

2. National stationary measures are those that affect all sources nationwide whether or not they are located in nonattainment areas.

3. Measures that affect motor vehicle emissions are listed as a group.

4. Area specific measures are those that, when mandated by a bill, are applied to a selected number of areas, whether it be all nonattainment areas or a subset of nonattainment areas. (Two of the motor vehicle measures, stage II refueling controls and alternative fuels, are also area specific measures).

5. Costs listed as progress requirements are those beyond the specific measures mandated by each bill, but that are necessary to meet interim emission reduction requirements or to attain the standard, whichever is binding. Identifiable controls (for which cost and emission reduction information is available) are applied first. The remainder of the progress requirement is made up of as yet unspecified "assumed" controls for which no specific cost data are available. Costs of assumed controls are estimated to range from $2,000 to $10,000 per ton with a best estimate of $5,000 per ton (Pechan, 1988).

As indicated in the footnotes to Table II.1, the percentage reduction is estimated based on what is expected to occur in ozone nonattainment areas. For most categories, the percentage reduction is calculated as the expected 1995 nonattainment area emissions for that category under the pre-1990 EPA policy minus the modeled 1995 nonattainment area emissions divided by the 1987 nonattainment area total emissions. (For projection years other than 1995, the percentage reduction is calculated in the same way, with that year's emissions substituted into the above

Table II.1

1990 Clean Air Act Amendments
Projection Year 1995

Measure	Reduction (1) %	National VOC Tons Reduced (thousands)	National Cost(3) (million $)
Base Program	13.3	-	-
RVP I	6.7	-	-
NATIONAL STATIONARY			
TSDF(2)	4.2	1,980	$420
Municipal Landfills(2)	0.9	200	110
Comm./Cons. Solvents	0.0	0	0
Architectural Coatings	1.6	330	0
Marine Vessels	0.1	12	26
MOTOR VEHICLES/FUELS			
RVP II	7.3	1,680	240
Evap/Running Loss	0.2	50	60
Tailpipe/Useful Life	<0.1	14	540
Stage II and Onboard	1.2	75	70
California Clean Fuels	0.0	0	0
Alternative Fuels	0.0	0	0
Reformulated Gas	1.9	89	1,400
AREA SPECIFIC MEASURES			
RACT to 50 tpy	0.5	33	42
New CTG	4.8	460	570
Enhanced I&M	3.3	210	64
Basic I&M	-	25	61
Ozone Transport Regions	-	160	190
PROGRESS REQUIREMENTS			
Identifiable Controls	¤	69	20
Assumed Controls	¤	19	92
NATIONAL TOTALS	46	5,400	$3,900 $3,800 to $4,000

RESIDUAL NONATTAINMENT AREAS: 25

(1) Percentage reductions in VOC emissions are estimated from nonattainment area totals or as a percentage of 1987 emissions in the areas where those measures apply.
(2) Measures EPA will implement under other legislation.
(3) Passage of the CAAA gives EPA authority to propose and promulgate a number of measures to reduce VOC. Many of these measures are in preliminary development stages and costs are uncertain at this time.

¤Percentage reductions for progress requirements are not shown because they apply only to a limited number of areas.

Table II.2

1990 Clean Air Act Amendments
Projection Year 2000

Measure	Reduction (1) %	National VOC Tons Reduced (thousands)	National Cost (3) (million $)
Base Program	11.0	-	-
RVP I	7.2	-	-
NATIONAL STATIONARY			
TSDF(2)	4.3	2,020	$430
Municipal Landfills(2)	0.9	210	110
Comm./Cons. Solvents	2.9	580	1,200
Architectural Coatings	1.7	340	0
Marine Vessels	0.1	12	27
MOTOR VEHICLES/FUELS			
RVP II	7.8	1,810	260
Evap/Running Loss	0.7	170	63
Tailpipe/Useful Life	0.4	100	570
Stage II and Onboard	1.5	220	76 to 250
California Clean Fuels	<0.1	1	90
Alternative Fuels	<0.1	<1	100
Reformulated Gas	2.5	120	1,600
AREA SPECIFIC MEASURES			
RACT to 50 tpy	0.5	33	42
New CTG	5.2	500	600
Enhanced I&M	3.4	210	70
Basic I&M	-	17	66
Ozone Transport Regions	-	150	200
PROGRESS REQUIREMENTS			
Identifiable Controls	*	150	49
Assumed Controls	*	225	1,300
NATIONAL TOTALS	50	6,900	$7,000 $6,300 to $8,400

RESIDUAL NONATTAINMENT AREAS: 5

(1) Percentage reductions in VOC emissions are estimated from nonattainment area totals or as a percentage of 1987 emissions in the areas where those measures apply.
(2) Measures EPA will implement under other legislation.
(3) Passage of the CAAA gives EPA authority to propose and promulgate a number of measures to reduce VOC. Many of these measures are in preliminary development stages and costs are uncertain at this time.

*Percentage reductions for progress requirements are not shown because they apply only to a limited number of areas.

Table II.3

1990 Clean Air Act Amendments
Projection Year 2005

Measure	Reduction (1) %	National VOC Tons Reduced (thousands)	National Cost (3) (million $)
Base Program	6.8	-	-
RVP I	7.8	-	-
NATIONAL STATIONARY			
TSDF(2)	4.4	2,100	$430
Municipal Landfills(2)	0.9	220	110
Comm./Cons. Solvents	3.0	590	1,200
Architectural Coatings	1.7	350	0
Marine Vessels	0.1	13	28
MOTOR VEHICLES/FUELS			
RVP II	8.4	1,970	280
Evap/Running Loss	1.2	310	68
Tailpipe/Useful Life	0.6	170	610
Stage II and Onboard	1.9	390	84 to 260
California Clean Fuels	0.1	2	0
Alternative Fuels	<0.1	2	0 to 360
Reformulated Gas	2.4	110	1,700
AREA SPECIFIC MEASURES			
RACT to 50 tpy	0.5	33	42
New CTG	5.5	530	640
Enhanced I&M	3.5	220	76
Basic I&M	-	15	72
Ozone Transport Regions	-	160	200
PROGRESS REQUIREMENTS			
Identifiable Controls	☆	120	58
Assumed Controls	☆	540	2,700
NATIONAL TOTALS	49	7,800	$8,900 $7,200 to $11,600

RESIDUAL NONATTAINMENT AREAS: 4

(1) Percentage reductions in VOC emissions are estimated from nonattainment area totals or as a percentage of 1987 emissions in the areas where these measures apply.

(2) Measures EPA will implement under other legislation.

(3) Passage of the CAAA gives EPA authority to propose and promulgate a number of measures to reduce VOC. Many of these measures are in preliminary development stages and costs are uncertain at this time.

☆Percentage reductions for progress requirements are not shown because they apply only to a limited number of areas.

☆☆For this analysis, it was assumed that the 4 most severe areas would not meet the standard before 2010. If these 4 areas meet less stringent EKMA estimated reductions for attainment, costs decrease by $230 ($90 to $450).

Table II.4

1990 Clean Air Act Amendments
Projection Year 2010

Measure	Reduction (1) %	National VOC Tons Reduced (thousands)	National Cost (3) (million $)
Base Program	1.7	-	-
RVP I	8.5	-	-
NATIONAL STATIONARY			
TSDF(2)	4.5	2,100	$440
Municipal Landfills(2)	1.0	220	120
Comm./Cons. Solvents	3.0	610	1,200
Architectural Coatings	1.8	360	0
Marine Vessels	0.1	13	28
MOTOR VEHICLES/FUELS			
RVP II	9.2	2,150	310
Evap/Running Loss	1.6	410	72
Tailpipe/Useful Life	0.8	220	650
Stage II and Onboard	2.2	510	92 to 280
California Clean Fuels	0.2	4	0
Alternative Fuels	<0.1	1	0 to 380
Reformulated Gas	2.5	110	2,000
AREA SPECIFIC MEASURES			
RACT to 50 tpy	0.5	33	42
New CTG	5.8	550	660
Enhanced I&M	3.8	240	83
Basic I&M	-	16	78
Ozone Transport Regions	-	170	210
PROGRESS REQUIREMENTS			
Identifiable Controls	☼	180	61
Assumed Controls	☼	1,030	5,200
NATIONAL TOTALS	47	8,900	$11,800 $8,700 to $17,000

RESIDUAL NONATTAINMENT AREAS: 4

(1) Percentage reductions in VOC emissions are estimated from nonattainment area totals or as a percentage of 1987 emissions in the areas where those measures apply.
(2) Measures EPA will implement under other legislation.
(3) Passage of the CAAA gives EPA authority to propose and promulgate a number of measures to reduce VOC. Many of these measures are in preliminary development stages and costs are uncertain at this time.
☼Percentage reductions for progress requirements are not shown because they apply only to a limited number of areas.
☼☼For this analysis, it was assumed that the 4 most severe areas would not meet the standard before 2010. If these 4 areas meet less stringent EKMA estimated reductions for attainment, costs decrease by $1,630 ($650 to $3,300).

relationship.) For measures that are not applied to all nonattainment areas, the percentage reduction is calculated by substituting into the above equation the emissions for the areas where the measure is applied. As an example, new CTG controls are only applied in moderate, serious, severe, and extreme nonattainment areas, so the emissions in marginal nonattainment areas are excluded from the calculation for that measure.

The purpose of the percentage reduction column is to allow the reductions that might be achieved in an average nonattainment area to which these measures are applied to be compared with emission reduction targets. As with any analysis where the modeling results for a number of different areas are combined, the percentage reductions shown may not be representative of what might be achieved in any individual area. Because not all measures are applied in all areas, the total percentage reductions shown at the bottom of the table best represent the average that might be expected from application of all of the mandatory measures (exclusive of progress requirements) in more serious areas.

Also included on the tables is the associated tonnage emission reduction. The tonnage reductions are national reductions from what the emissions would have been given a continuation of the pre-1990 amended CAA.

The following sections of this chapter discuss the results and modeling assumptions by measure in the same order as they are presented in the results tables.

A. NATIONAL STATIONARY MEASURES

National stationary source measures include those that regulate emissions from hazardous waste TSDFs, municipal landfills, commercial/consumer solvents, architectural coatings, and marine vessels.

1. Consumer Solvents

Results for commercial and consumer solvent control are especially uncertain due to the limited regulatory development for these source types. The 1990 CAAA direct EPA to complete a study of significant VOC emitting products by November 15, 1993. EPA must then regulate categories of consumer or commercial products that account for at least 80 percent of the VOC emissions. Four prioritized groups will be developed with a new group regulated every two years. It is assumed that the first group to be regulated is architectural surface coatings.

Emissions from architectural surface coating can be reduced by reformulating to waterborne coatings. Architectural coatings are reduced by 52 percent at no net cost. These assumptions are consistent with prior modeling.